There are two planetary formation scenarios: core accretion and gravitational disk instability. Most extrasolar gaseous objects discovered to date are thought to be formed from the core accretion, based on a fact that gaseous objects are preferentially observed around metal-rich host stars. Here, we present the 623 samples in 520 planetary systems comprising gaseous planets and brown dwarfs discovered by radial velocity measurements in three mass regimes with boundary values of 4 and 20 Jupiter-mass in terms of the host-star metallicity through performing a cluster analysis to the samples, minimizing an impact of the selection effect of radial velocity for the host star metallicity on the cluster analysis. The larger boundary is thought to be a boundary between planet and sub-stellar formations around G-type stars, being in agreement with the upper mass limit of the core-accreted planets predicted by some theoretical studies. The distributions of host-star metallicities, masses and eccentricities for the planetary samples with masses less than 20 Jupiter-mass can be naturally explained by the core accretion model. In contrast, the lower mass limit seems to reflect a difference between formation processes early-type and G-type stars. A population with masses ranging from 4 to 20 Jupiter-mass orbiting the early-type stars may be planets formed via the gravitational disk instability process, preferably orbiting metal-poor stars.